

CLAIMS

1. A catalyst for hydrotreating gas oil, which comprises on an inorganic oxide support 10 to 40% by weight of at least one selected from metals in the Group 6 of the periodic table, 1 to 15% by weight of at least one selected from metals in the Group 8 of the periodic table, 1.5 to 8% by weight of phosphorus, each in terms of an oxide amount based on the catalyst, and 2 to 14% by weight of carbon in terms of an element amount based on the catalyst,

wherein the catalyst has a specific surface area of 150 to 300 m²/g, a pore volume of 0.3 to 0.6 ml/g, and an average pore diameter of 65 to 140 Å, and

wherein, when the catalyst is observed on a diffuse-reflectance FT-IR after sulfidation treatment and subsequent NO adsorption, a value of I₈ group/(I₈ group + I₆ group) is within the range of 0.7 to 1 wherein intensity of NO spectrum (1840 cm⁻¹) adsorbed on the metal in the Group 8 of the periodic table is represented by I₈ group and intensity of NO spectrum (1700 cm⁻¹) adsorbed on the metal in the Group 6 of the periodic table is represented by I₆ group.

2. The catalyst according to claim 1, wherein the catalyst has a pore distribution that a ratio of pores having a pore diameter of the average pore diameter ± 15 Å is from 30 to 75%.

3. The catalyst according to claim 1 or 2, wherein an average number of laminated layers of disulfide of the metal in the Group 6 of the periodic table observed through a transmission electron microscope after presulfidation of the catalyst is from 2.5 to 5.

4. The catalyst according to claim 1 or 2, wherein an average in-plane-direction length of layers of disulfide of the metal in the Group 6 of the periodic table observed through a transmission electron microscope after presulfidation of the catalyst is from 1 to 3.5 nm.

5. A process for producing the catalyst of any one of claims 1 to 4, which comprises supporting 10 to 40% by weight of at least one selected from metals in the Group 6 of the periodic table, 1 to 15% by weight of at least one selected from metals in the Group 8 of the periodic table, 1.5 to 8% by weight of phosphorus, each in terms of an oxide amount based on the catalyst, and 2 to 14% by weight of carbon in terms of an element amount based on

the catalyst, on an inorganic oxide support having a specific surface area of 230 to 500 m²/g, a pore volume of 0.5 to 1 ml/g, and an average pore diameter of 60 to 120 Å, using a solution comprising the metal in the Group 6 of the periodic table, the metal in the Group 8 of the periodic table, an organic acid, and phosphoric acid, followed by drying at a temperature of 200°C or lower.

6. A process for hydrotreating gas oil, which comprises subjecting a gas oil fraction to a catalytic reaction in the presence of the catalyst of any one of claims 1 to 4 under conditions of a hydrogen partial pressure of 3 to 8 MPa, a temperature of 300 to 420°C, and a liquid hourly space velocity of 0.3 to 5 hr⁻¹.